Abstract Details

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Title: Meteorologic Control on Physical and Chemical Weathering Rates and Material Fluxes from a Tropical (Kaoping) River Watershed in Taiwan

Abstract:
Recently worldwide studies have demonstrated the important role of rivers from western Pacific islands in transporting terrestrial materials to the oceans. The Kaoping River is a tropical, high-standing island-type river with the largest drainage area in Taiwan. In addition to the impact of ubiquitous human activity, the study area is also greatly influenced by a peculiar rainfall pattern with frequent occurrence of tropical storm during the wet season. In order to understand the physical and chemical weathering rates of river basin, the temporal and spatial distributions of hydrochemical parameters, total suspended matter (TSM), major ions, dissolved and particulate species of carbon and nutrients in the Kaoping River were investigated from August 1999 to December 2002. The total, physical and chemical weathering rates were estimated to be 4739, 3601 and 1138 g/m2/yr, respectively, during 1999-2000. Such physical and chemical weathering rates are much higher than those reported from world rivers. Silicate weathering determines primarily river water alkalinity and results in an efficient CO2 consumption in the watershed. However, the total, physical and chemical weathering rates were only 1072, 656 and 416 g/m2/yr, respectively, during 2001-2002. Such a big difference of inter-annual weathering rates is primarily caused from a significant difference of rainfall between two periods determined by the frequency of typhoon. The yield of total carbon (DIC+DOC+PIC+POC) from the Kaoping drainage basin was about 140 gC/m2/yr during 1999-2000, but only about 53.7 gC/m2/yr during 2001-2002. Carbon yields in 1999-2000 are very high in comparison with those from other major rivers in the world. The yield of particulate carbon appears to be more sensitive to rainfall change than that of dissolved carbon. The annual yields of dissolved Si (0.41 mole/m2/yr), dissolved N (0.74 mole/m2/yr) and dissolved P (0.011 mole/m2/yr) are relatively high in 1999-2000, implying high weathering rate and nutrient pollution in the watershed. The fluxes of naturally derived total nitrogen and phosphorus were 8x103 and 4x103 kg/d, which were equivalent to 16% and 57% of anthropogenic inputs, respectively. This study confirms that small mountainous rivers collectively may contribute significantly to global fluxes of terrestrial materials.

Presentation Mode:

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